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THE COPENHAGEN MEETING OF THE INTERNATIONAL METEOROLOGICAL COMMITTEE.

IT may be remembered that when the representatives of Official Meteorology were assembled at Rome, they elected nine of their own body as a permanent committee to watch over and as far as possible harmonize the work of the Government meteorological establishments in each country.

We may as well prevent the possibility of misconstruction by stating that the words official meteorology are introduced solely as the shortest term whereby to indicate that these various International meetings do not represent anything except the views of the heads of the various government establishments. No one would deny that it would be difficult, probably impossible, to collect a more distinguished group of meteorologists than the members of the Congress at Rome, all that we want to point out is that after all the word International is and must be qualified by the word Official. For instance, there was no separate vote representing the Meteorological Societies of England, France, Scotland, or Austria; none to represent the observatories of Greenwich, Oxford, or Stonyhurst; none for Montsouris; none for the vast meteorological system of India; none for the system which covers nearly 100° of longitude in the dominion of Canada; none for the observatories and systems of our various Australian colonies and Mauritius; none for the Mexican system or many others.

If we have spoken in high terms of the whole of the Congress at Rome, it will only be necessary to report the members selected therefrom for the International Committee to support our proposition. The original members were:—MM. Buys Ballot, Cantoni, de Brito Capello, Hann, Mascart, Mohn, Neumayer, Scott, and Wild.

This body has just been holding its second meeting, and we have been favoured with the following epitome of its proceedings:—

The second meeting of the International Meteorological Committee took place at Copenhagen, August 1–5 inclusive. All the Members were present, except Professor Cantoni, who has resigned his seat

on the Committee on account of health. Professor Tacchini was unanimously elected in his place. The following brief account of the more important of their proceedings is in the numerical order in which the respective subjects were discussed :—

It was resolved—

(*a*) To organize an exhibition in connection with the International Fisheries Exhibition, London, of the methods and apparatus used in different countries for giving weather intelligence and storm warnings to the coasts, and of the instruments, &c., used in the study of Ocean Meteorology.

(*b*) To issue a circular to all existing organizations, requesting them to supply data as to their condition and operations up to the end of the current year.

(*c*) To request the several institutions to be more precise in the information published by them as to the hour of occurrence of rain and other phenomena.

(*d*) To request all institutions to append to their Daily Bulletins, Monthly Sheets giving the mean results for the month, in the same way as the London Office has done since 1880.

(*e*) To request all institutions to furnish particulars of any stations which may exist in distant localities, especially in the Torrid Zone, South America, and the Islands of the Pacific, at least during the period of the International Polar Observations, and to publish the names of such stations in the Polar Bulletin issued by Professor Wild.

(*f*) To express approval of the plan proposed by Capt. Hoffmeyer and Dr. Neumayer, to publish daily synoptic charts of the Atlantic Ocean, with an explanatory text, at the cost of the respective institutions of Copenhagen and Hamburg, and to recommend other institutions to contribute materials for the work if they can.

(*g*) M. Tietgens, Chairman of the Great Northern Telegraph Company, submitted to the Committee a plan for a cable to connect Iceland and the Faroes with Europe, the expense to be met by the receipts from Meteorological telegrams. The Committee, while recognizing the very great importance which information coming from Iceland and the Faroes must possess in relation to the issue of Storm Warnings and Forecasts in Europe, felt that they were not in a position to express an opinion on the practical execution of the project.

(*h*) The Sub-Committee nominated at Berne (MM. Mascart and Wild) submitted specimens of their proposed International Reduction Tables. It was resolved to print a full page of each of these tables, with explanations, and

submit them to Meteorologists for their opinion, with the view of subsequently publishing the tables by means of subscriptions from the different institutes.

(*i*) M. van Rysselberghe's proposal to communicate by wire the indications of his instruments at out stations to central offices was considered, and that gentleman was requested to draw up and publish a detailed scheme for its execution.

(*j*) A Committee was nominated, consisting of M. de Brito Capello, Rev. Clement Ley, and Professor Hildebrandsson, to draw up a scheme of instructions for the observations of "cirrus" clouds.

(*k*) It was resolved that the prospects of the preparation of a general catalogue of Meteorological Bibliography were not favourable to its execution, and that the only action for the Committee to take was to invite the heads of the different institutes to prepare catalogues of the meteorological literature of their respective countries.

It only remains to say that the Members of the Committee were most hospitably entertained during their stay in Copenhagen, they were honoured with an invitation to dine with the King on the 5th inst., and on the following day an excursion was organized for them by the Marine Ministry to Friederichsborg and Elsinore; which was fortunately favoured with fine weather.

ROBERT H. SCOTT,
Secretary.

REVIEW.

Les Courants atmosphériques d'après les Nuages au point de vue de la Prévision du temps. Par André Poëy, Fondateur et ancien directeur de l'Observatoire physique et météorologique de la Havanne. 8vo.—PARIS: Gauthier-Villars, 1882.

IT is somewhat refreshing to receive a work upon Meteorology with ten times as many pages of letter-press as there are of tables. While at Havannah Prof. Poëy was certainly among the largest contributors to the "millions of observations," of which we so often hear, and even in the present work we find a reference to the 214,471 observations of the barometer made at Havannah in the one year 1862, but in the present book almost the only tabular matter is in an appendix of 8 pages.

By way at once of introducing the subject and of giving an idea of the style of the work, we append a rough translation of the first section of Chapter I.

"We endeavoured in our previous volume to sketch the Genesis of clouds from a study of the evolution of water in its forms of vapour, snow and ice, and under the influence of the concomitant meteorological-manifestations. We proved that the form of clouds is due

to their integral structure, which is inseparable from the physical constitution of the various layers of the atmosphere, where the action of weight, pressure, heat and humidity undergo constant changes indicated by the presence of special formations of clouds; that there are but two characteristic types of cloud, the Cirrus formed of frozen particles, and the Cumulus formed of watery ones; all other forms are evolved from these two types; that there exists in the evolution of the clouds a scale of complication or increasing speciality, from the upper region of the Cirrus down to the Fracto-cumulus near the surface; that one may regard the atmosphere in a vertical sense as divided into two great regions, each having physical characteristics and meteorological products quite distinct; that usually the Pallio fractus forms the boundary between these two layers. It is at this intermediate layer where the watery particles are changing into snow or ice that the meteorological manifestations are developed.

"In the region below this are produced thunder storms, rain, snow, hail, the easterly trades, surface winds, and optical phenomena dependent on reflection, such as rainbows and coronæ. The general movements of the atmosphere have their origin in the upper regions, as have also equatorial storms, the westerly trades, and optical phenomena dependent on refraction such as halos, parheliæ and paraselenæ. Accordingly, heat and moisture prevail in the lower regions, cold and dryness in the upper, and hence the formation and structure of the clouds.

"In the upper region the vapour of water is precipitated in the form of ice needles and in the formation of cirrus; in the middle region in that of snow crystals and cirro cumulus, and in the lowest region in that of watery particles, and of cumulus. The forms of the clouds are modified by the physical properties of the surrounding media.

"The atmosphere may therefore be regarded as consisting of a series of concentric beds of constantly varying properties and in which the clouds are modified from the cirrus or cumulus to an extent corresponding with their altitude. From the altitude alone it is therefore possible to determine the physical constitution of the stratum and the characteristic form of cloud, and *vice versâ*. The elements are all intimately related and the knowledge of any one enables us to deduce the others. When observers are thoroughly persuaded of the truth of these facts they will have a powerful guide in their observations of clouds, they will recognize the importance of employing a nomenclature in harmony with the present state of the science, and perhaps they will adopt that which we have proposed.

"Our object in this volume is to show that in the circulation of the atmosphere there exist two antagonistic currents, horizontal and vertical, ascending and descending, and that their dynamic energy or potential is intimately related to the barometric gradient."

Could there be a greater contrast than that exhibited by comparing

the views above suggested with the intensely heavy and uninteresting information given by nearly all the official publications of the present day—few of which tell us more than the number of tenths of the sky covered by cloud, and of which the better ones arrive at some such interesting statement as—"Amount of cloud 6, ci-cu; cu-str."

If we may not say that Prof. Poëy's heart is in the clouds, at any rate no one can read this work without being impressed by the extent of his reading, the justice of many of his remarks, and the vigour with which he shows how little the various International congresses and conferences have done towards the improvement and development of cloud observations, the latter being emphasized by contrast with the attention given to the subject by Clement Ley, and Hildebrandsson.

In order to give a general idea of the work we take from the table of contents a few of the headings, some for one reason some for another.

"Upper currents as indicated by Cirri—The official world has done almost nothing—The three primary sources, Clement Ley, Hildebrandsson and Poëy—Cirrus as a wind vane."

"Universality of Solar meteorology—Terrestrial meteorology depends on that of the sun—Meteorology is cosmopolitan—Its phenomena extend from Pole to Pole."

"Confirmation of the Anti-Trades—The movements of cirri confirm the theory established by Halley and Hadley."

"The clouds and the Official World—Five Conferences and Congresses have done almost nothing—At Leipzig, out of 61 savants, only 6 replied to Question 16—Amount of cloud. At Vienna, out of 32 delegates, 11 took part in discussing the subject of cloud observations, but nearly all the time was spent in discussing modes of recording total space covered—At the London Maritime Congress the result was similar—At the Paris Congress the subject was not discussed, the only reference to clouds being unimportant ones by Silbermann and G. Tissandier—At Rome 16 subjects were selected as of special interest, but 'the clouds' was not one of them."

"Cloud observations have been misunderstood—The question remains nearly where it was left by the Brussels Conference 26 years since—Nearly all atmospheric disturbances have their origin in the upper regions of the atmosphere—All cirrus observers have independently arrived at this conclusion, and it is and has been shared by Buys Ballot, Ferrel, Dove, Faye and Biot."

Our selections from the contents have taken much space, but we believe that they will be useful, both as showing how much is traceable to cloud study, and in suggesting that future writers on atmospheric movements must not omit to examine Professor Poëy's statements, especially since in this, as in most of his works, he is careful to give complete bibliographical information in support of his

quotations. In fact, it may be well to mention, that there are 130 separate notes of authors quoted in the work.

One parting suggestion. Is it possible that the reason that shepherds and fishermen are such good weather-prophets is that they do study the form and character of the clouds, and that in their rough way they get a truer insight than do those excellent observers who determine that the mean amount of cloud at 9 a.m. is 6·7 and at 9 p.m. 7·1? Interesting facts, no doubt, but surely not all that we ought to learn from the ever varying aspects of cloudland.

REFLECTED RAINBOWS.

BY W. STANLEY JEVONS, LL.D., F.R.S.

SOME years ago considerable discussion arose upon the question whether it is possible to see a reflected rainbow. Artists having been in the habit of inserting beautiful reflected bows in their landscapes, it was denied by some persons that such reflection could be seen, apparently on the ground that each person sees his own rainbow. It might easily be proved, indeed, from the laws of optics, that there is nothing to prevent the reflection of a rainbow, though it is true that the bow as seen reflected is not precisely that seen by direct vision. The sun's rays which have been refracted in the rain-drops may be reflected again and again from any suitable surfaces, and may still reach the eye of some observer.

But though a reflected rainbow is to be seen, there are comparatively few people, I imagine, who have seen one. I have all my life looked out for any curious phenomenon of the sort, and have, on several occasions, seen beautiful lunar rainbows, which are considered rare appearances. Only two years ago did I for the first time notice a reflected solar rainbow. The rarity of the occurrence is no doubt due to the fact that it needs the combination of three independent conditions to allow of the observation. In the first place there must be a bright bow, which is not seen many times in the year; secondly, he who sees the bow must happen to be in the neighbourhood of a piece of water suitable in extent and position to reflect the bow; thirdly, the water must be tranquil enough to allow of reflection. The last condition will usually be wanting, because rain-clouds will, in most cases, be accompanied by wind.

About two years ago, however, I saw a bright reflected rainbow, and what struck me much was that it assumed a form and character which I could not possibly have foreseen. I was on a steamboat, steaming up one of the lower and broader reaches of the lovely Hardanger Fyord. The water happened to be almost perfectly tranquil, and yet at the same time a brilliant bow appeared upon a heavy shower of rain, which was falling at the further side of the fyord. The brilliant colours of the bow were finely contrasted against the darkness of the cloud and of the surrounding fyelds, and as the boat advanced through the glassy water it was easy, from the head of the vessel, to see a bright reflection. Instead, however, of the perfect segment of a circle, with all the seven colours clearly distinguished, I was surprised to see something entirely different, namely, a broad and nearly straight streak of confused whitish light, extending from the base of one side of the bow, to within ten or twenty yards of the steamer, where the light rather suddenly curved off in an awkward sickle-like

form, and was soon abruptly lost. The fact is that the water, although so placid and glassy, was affected by a ripple almost imperceptible except by its disfiguring effect upon the bow. Now, as we see in the case of the sun or moon setting over a placid sea, the effect of such a ripple is to spread out the reflection into a long streak, each wave, within certain limits of distance, having some part of its surface disposed at a suitable angle to produce reflection. A complete rainbow springs perpendicularly at the sides, and approaches the horizontal at the summit. If we imagine the bow cut up into nearly square segments, it follows that many of these segments in the legs of the bow will be reflected into streaks, and these streaks will be superimposed upon each other. Thus the full light of the bow will there be seen reflected undiminished by the scattering effect of the ripple, and as different coloured rays, derived from different parts of the bow, will be mixed together, they will, in accordance with the Newtonian theory of light, be fused together into white light. As regards the summit of the bow, however, there would be no superposition of reflected streaks, and the one thickness of the bow would give insufficient light to be perceptible.

Without in the least denying that a person may casually, and still more probably by intention, witness a rainbow reflected in all its beauty of form and colour, I have no hesitation in saying that nine times out of ten the reflected bow will be no bow at all, but only a whitish streak. Artists will doubtless continue to paint reflected rainbows as they are seldom or never seen, rather than as they are seen.

It should be added that since I began to write this little article, I have happened to see a rainbow almost perfectly reflected, both as regards form and colour, upon the flat wet sands of the sea-shore. The watery surface, being unaffected by the moderate breeze which was blowing, acted as a nearly perfect mirror. Although persons walking upon flat wet sands see the clouds fully reflected therein, I cannot call to mind that I ever saw this effect represented in landscape paintings. I am, of course, far from denying that it may have been often so represented.—*The Field Naturalist, August*, 1882.

FORESTS AND METEOROLOGY.

An important paper in *Polybiblion* on this subject gives the results of observations made during the last six years under trees, and not far from the edge of a forest, and also in the plain, and far from all trees.

1. Forests increase the quantity of meteoric waters which fall on the ground, and thus favour the growth of springs and of underground waters.

2. In a forest region the ground receives under cover of the trees as much water as, or more, than the uncovered ground of regions with little or no wood.

3. The cover of the trees of a forest diminishes to a large degree the evaporation of the water received by the ground, and thus contributes to the maintenance of the moisture of the latter, and to the regularity of the flow of springs.

4. The temperature in a forest is much less variable than in the open, although, on the whole, it may be a little lower; but the *minima* are there constantly higher, and the *maxima* lower than in regions not covered with wood.

These observations have been made in the neighbourhood of Nancy, and by the pupils of the School of Forestry of that city, under the direction of M. Mathieu, sub-director of the school.

M. Fautrat, when sub-inspector of forests at Senlis, made during four years, but on a different method, observations on forestial meteorology, which fully and completely corroborate in certain respects those of M. Mathieu. The laws which seem to follow from the figures given by M. Fautrat, as well as an inspection of the curves which graphically represent them, are as follow :—

1. It rains more abundantly, under identical circumstances, over forests than over non-wooded ground, and most abundantly over forests with trees in a green condition.

2. The degree of saturation of the air by moisture is greater above forests than over non-wooded ground, and much greater over masses of *Pinus sylvestris* than over masses of leaved species.

3. The leafage and branches of leafed trees intercept one-third, and those of resinous trees the half of the rain water, which afterwards returns to the atmosphere by evaporation." On the other hand, these same leaves and branches restrain the evaporation of the water which reaches the ground, and that evaportion is nearly four times less under a mass of leafed forest than in the open, and two and one-third times only under a mass of pines.

4. The laws of the change of temperature out of and under wood are similar to those which result from the observations of M. Mathieu.

SUNSPOTS, MAGNETIC STORM AND AURORA AUSTRALIS.

[Our readers may remember an article with the above title in the June number of this Magazine, in which the simultaneity of the appearance on April 16th, 1882, of a huge sun spot, and of a magnetic storm and aurora Australis was dwelt upon. In the last number (August) of *The Observatory* there is an account of the Aurora Borealis seen in the United States on that day, which is in many respects so excellent as to demand that it be laid before all our readers.—ED. *M. M.*]

SOLAR OUTBURST AND AURORAL DISPLAY.

[FROM *The Observatory*, AUGUST 1, 1882.]

SIR,—After having read in the *Observatory* several accounts of the outburst on the Sun in April, which fail to mention the grand aurora following, I conclude that it was not seen in England, and send you a note relating its appearance here. Sunday, April 16th, 1882, will pass into the history of astronomy as an eventful day. The Sun was in violent agitation throughout the day; and colossal centres of cyclonic activity were clearly seen in my telescope—a 6 in. Clark equatoreal. There were seen during the day 111 spots,

the largest being 67,000 miles in length and 48,000 miles in width. These were arranged in 10 clusters, none being far from the equator of the Sun. The largest number of spots seen in any cluster was 34, each aggregation having two or more very large, the remainder varying in size from medium to small.

The great spot was seen at this observatory at 8 a.m., April 15th, already advanced on the eastern edge of the sun 15°. Throughout the 15th it did not display unusual turbulence; but during the night activity set in, for on the 16th its internal structure had materially changed. It was cut into four portions by "bridges," but these did not maintain the same position an hour. They were widening, contracting, or bending into ever-changing forms, displacement being detected at half-hour intervals. At 9 a.m. two tongues of fire were pointing toward each other from opposite sides of the abyss, and at 0.30 p.m. passed, leaving quite a space between. Shortly after, they began to show curvature, and at 2 p.m. formed a circle—clearly a case of solar cyclone. Every large spot had bridges, complete or in the process of formation. In the large chasm, at about 4.30 p.m., one of the bridges split lengthwise, the separation requiring two hours to become complete, while the ends of several jets were tufted and tasselled with filaments of white-hot matter, which, nearly coinciding with the centre of one of the largest divisions, presented the appearance of the whirlpool rapids below Niagara, as they would be seen were that frenzy of water instantly rendered motionless. There were three clusters of faculæ also on the Sun—brilliant places much brighter than the general surface. The terrestrial atmosphere being in fine condition for telescopic definition, the "rice-grains," granulations, and "pores" all over the sun could be distinctly seen. We watched the solar orb the entire day, and when it vanished, wished the day might be longer; but night brought still other wonders in the heavens.

At 9 p.m., while viewing Wells's comet, it waned and disappeared. Looking out to learn the cause, its obscuration was found to come from the arc of an advancing aurora. The apparition presented a yellowish-green arc of a circle, whose altitude was 18°, the ends resting on the eastern and western horizons. The breadth of the band of light was 5°, clear sky revealing the stars in Cassiopeia, which were between it and the northern horizon. The centre of the auroral arc did not appear to be on a line below Polaris; and on measuring the displacement we found the eastern termination of the arc to be 15° north of the equator, while the western was 25° north, the centre being 10° east of the pole. For nearly an hour the phenomenon developed no sign of coming grandeur; but at 10 p.m., three pillars of crimson light shot up to an altitude of 40° from the western extremity of the arc, a few yellower streamers ascending in the east. These seemed to be a preconcerted signal with the celestial pyrotechnists, for within two minutes the whole arc flashed and trembled, and then expanding, ascended 8°, when a halt was made. This did not last more than a minute, when two flashes in rapid succession were seen throughout the widened arc, now 20° broad. A mighty upheaval followed, the apex of the band at once rose to Polaris, filling the northern heavens with light brilliant enough to read by. The altitude of the pole at this observatory is 41° 13′; and as there was still open sky under the band 10° in breadth, the belt of light was 30° wide.

The great Aurora reserved its forces a few moments and then discharged simultaneously hundreds of columns of scarlet, violet, and light yellow streamers, instantly converging at the zenith.

This display waned only to make way for another more magnificent, and so the whole night passed, outbursts succeeding each other in rapid movement. From midnight to 1 a.m. April 17th the phenomenon was at its height, the whole northern heavens from the horizon to the equator being striped and banded with varying streams flashing incessantly. A wave of light would appear in the northern horizon, and instantly rush to the zenith, producing curvature in the straight columns, which at once resumed their original position when the wave passed, only to be wrought again in a few seconds.

The whole northern hemisphere quaked with the rapidity of lightning without cessation during the hour following midnight, each upheaval impelling light-emitting matter to the zenith, where it was no longer agitated, but floated slowly south. Much of this actually descended as far as Scorpio, 30° south declination, so that nearly the entire celestial vault was filled with the coruscations. This unparallelled display of auroral activity was still in motion at 4.30 a.m., 17th, when the solar rays obscured the scene.

The sun-spot turbulence, the aurora, and a magnetic storm occurring all at one time, seem to indicate a bond of union between solar and terrestrial energy, the secret of which yet eludes research. The perpetual flashing of the heavens was the most marked feature of the aurora, giving rise to a scene of appalling grandeur and sublimity.

EDGAR L. LARKIN.

Observatory, New Windsor, Ill., U. S. A., June 17th, 1882.

THUNDERSTORM, JULY 8TH.

To the Editor of the Meteorological Magazine.

SIR,—We had a thunderstorm here on Saturday, July 8th, with the most tremendous rain I ever witnessed. The thunder began about 1 p.m., and from 2 to 4 there was a perfect deluge of rain with fierce lightning and very loud thunder. There was a short sharp hailstorm about 3. Thinking my rain gauge would overflow, I took off 2 inches of water about 4 o'clock, and on Sunday morning there was 0·20 more, making 2·20 inches in the 24 hours. I have, I believe, never measured as much as 2 inches before. The little river in the valley before the house rose over its banks, and filled the valley, which I think is nearly 100 yards wide. A good deal of hay lying cut has been washed away, and there are furrows in my gardenwalks, a foot deep. I picked up with my own hands a live trout, of a quarter of a pound weight, stranded in a small gutter, to which place it must have been washed by the overflow of a pond 50 or 60 yards off.

Yours very sincerely,

EDWARD COODE.

Polapit Tamar, Launceston, July 10th, 1882.

EXCESSIVE RAINFALL.

To the Editor of the Meteorological Magazine.

SIR,—Between the hours of 8.45 a.m. July 11th, and 8.45 a.m. July 12th, the rainfall was 2·25 in., the greater part of which fell

between 4.30 and 7 p.m. on Tuesday, 11th. This has been the greatest recorded in this neighbourhood, in 24 hours, for more than 13 years, with the exception of July 14th, 1875, when 3·11 in. fell, but on July 14th, 1880, 2·11 in. fell in the same number of hours (1·14 in. of which was registered after a thunderstorm lasting half an hour).

Yours truly,

RICHARD GORTON.

Cirencester, July 18th, 1882.

MULTIPLE RAINBOWS.

To the Editor of the Norfolk Chronicle. [*Reprint.*]

SIR,—Some of your readers may be interested in the description of a phenomenon I witnessed on July 5th, and which does not seem to have been widely observed. At about 6.15 p.m. my attention was attracted to a very brilliant rainbow, the whole arch being traceable from base to base; below it and contiguous were two fanit reflections of the bow, then about 10° above it was another faint bow, and about 10° higher still, two more faint reflections of the prismatic colours, making six in all. I was told we should have nine days' rain after this, and we have certainly had many showers every day since, as yet.

Yours faithfully,

J. ALFRED LAURENCE.

Dilham Vicarage, Norfolk, July 11th, 1882.

A WET JULY.

To the Editor of the Meteorological Magazine.

SIR,—The month of July is nearly always a very rainy one in this district, but this year it has exceeded any month since I first began to keep a register, in 1867.

Rain fell on 22 days, and the total amount was 9·15 in.—that on the 7th was 2·37.

We had an occasional bright day, which was generally followed by a very wet one, greatly to the annoyance of the farmers and the injury of their hay. Other crops have also suffered to some extent from excessive wet and deficient sunshine. We have had as yet very little summerly weather.—Yours truly,

C. WILSON.

Calder Mount, Garstang, North Lancashire, August 3rd, 1882.

SNOW IN JUNE.—On Sunday, 18th June, 1882, snow and sleet fell at South Kilvington, near Thirsk—an occurrence which has not happened in the middle of June in the district for many years.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1882.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Maximum. Date.	Minimum. Temp.	Minimum. Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	63·9	20	28·5	4	55·5	38·1	41·1	84	128·7	25·2	1·35	11	5·1
Cape of Good Hope	...	...	...	...	...	...	...	...	...	...	...	...	...
Mauritius	83·4	1	69·0	16	80·7	73·8	70·2	80	...	...	17·53	26	7·8
Calcutta	99·0	24	63·2	5	93·0	69·8	68·1	68	156·7	51·5	·52	1	1·6
Bombay	93·4	27	66·1	4	86·8	73·7	69·4	69	148·1	53·3	·02	1	1·4
Ceylon	92·2	14	71·8	7	89·3	75·8	73·1	74	154·0	67·0	2·36	10	4·5
Melbourne	102·1	10	45·3	27	78·0	54·7	51·1	64	155·7	36·2	·94	8	5·3
Adelaide	100·0	7	50·5	20	83·4	61·7	51·5	48	157·0	39·6	·49	7	4·2
Wellington	78·0	16	47·9	25	68·3	56·5	...	...	135·0	42·0	3·65	12	...
Auckland	80·0	7	45·1	25	72·5	61·2	59·3	77	131·6	44·0	4·39	14	7·4
Falkland Isles	62·2	14	28·9	22	51·8	39·3	41·5	81	122·2	20·2	2·76	25	7·3
Jamaica	87·5	18	64·9	12	84·1	67·6	67·4	79	...	58·4	1·23	...	3·1
Barbados	80·0	var.	66·0	30	79·0	70·0	68·9	79	149·0	...	2·02	8	6·0
Toronto	56·2	27	15·4	31	38·3	25·4	25·8	75	119·0	8·0	2·12	16	7·3
New Brunswick, S. John	45·0	2	8·0	16,25	33·2	20·7	25·5	87	...	...	6·16	15	5·9
Cape Breton, Sydney	45·8	28	−12·8	16	31·3	12·9	20·4	84	...	...	6·01	15	6·5
Newfoundlnd, S. John's	...	...	...	...	...	...	...	...	...	...	...	...	...
Manitoba, Winnipeg	38·3	26	−24·3	24	24·2	−0·5	14·0	90	...	...	2·48	11	5·7

REMARKS, MARCH, 1882.

Mauritius.—Rainfall, 10·59 in. above the average; mean pressure (corr. and red.) 29·934 in. Mean hourly velocity of wind, 12·1 miles; extremes, 32·5 miles on 13th, and 0·0 mile on 20th; prevailing direction, E.S.E. to E. T and L on seven days. C. MELDRUM, F.R.S.

CEYLON.—TSS occurred on 14 days, and L was seen on 4 other days. J. STODDART.

Melbourne.—Mean pressure, humidity and amount of cloud below the average; mean temp. 0°·4 above, and rainfall, 1·06 in. below it. Prevailing direction of wind, S. and S.E.; strong breezes occurring on 9 days; greatest hourly velocity, 24 miles on 14th. Heavy dew on 7 days, dense fog on 9th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. (72°·5) nearly 2° above the average, the max. reaching 90° on 11 days, 3 days more than the average number. A most severe water famine was experienced throughout this Colony and Victoria during this and the preceding month, but towards the end of March a few slight showers fell, and the long continuance of hot weather appeared to be breaking up. C. TODD.

Wellington.—Dull wet weather prevailed up to the 7th, followed by pleasant weather till 16th; from 17th to 25th windy and showery, and the remainder of the month fine and generally cool. Prevailing winds, S.E. and N.W. Mean pressure and temp. both slightly above the average; rainfall, ·81 in. above it. R. B. GORE.

BARBADOS.—Mean pressure, ·16 in. below the average of 17 years; mean temp. 73°·9, also slightly below it. Prevailing direction of wind, N.E.; average velocity, 13·5 miles per hour, 30 per cent. above the average of 10 years; extremes, 20·2 miles and 8·2 miles. Rainfall 6 per cent. above the average of 25 years, and evaporation 8 per cent. below it. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL, JULY, 1882.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	3·01	XI.	Castle Malgwyn	5·60
,,	Margate, Birchington...	2·13	,,	Rhayader, Nantgwillt..	7·45
,,	Littlehampton	2·57	,,	Carno, Tybritle	5·08
,,	St. Leonards	2·47	,,	Corwen, Rhug	4·64
,,	Hailsham	...	,,	Port Madoc	7·24
,,	I. of W., St. Lawrence.	2·83	,,	I. of Man, Douglas	5·42
,,	Alton, Ashdell.....	3·30	XII.	Carsphairn	8·61
III.	Great Missenden.....	2·71	,,	Melrose, Abbey Gate...	3·78
,,	Winslow, Addington ...	3·06	XIII.	N. Esk Res. [Penicuick]	4·70
,,	Oxford, Magdalen Col...	3·56	XIV.	Ayr, Cassillis House ...	5·39
,,	Northampton	3·18	,,	Glasgow, Queen's Park.	4·03
,,	Cambridge, Beech Ho...	2·04	XV.	Islay, Gruinart School..	4·38
IV.	Southend	1·71	XVI.	Cupar, Kemback.....	...
,,	Harlow, Sheering	1·78	,,	Aberfeldy H.R.S.	4·26
,,	Diss	2·83	,,	Dalnaspidal	5·45
,,	Swaffham	3·04	XVII.	Tomintoul.....	...
,,	Hindringham	2·12	,,	Keith H.R.S.	4·14
V.	Salisbury, Alderbury...	...	XVIII.	Forres H.R.S.	2·19
,,	Calne, Compton Bassett	3·76	,,	Strome Ferry H.R.S....	6·60
,,	Beaminster Vicarage ...	4·88	,,	Lochbroom	4·94
,,	Ashburton, Holne Vic..	7·46	,,	Tain, Springfield.....	3·58
,,	Torrington, Langtree W.	..	,,	Loch Shiel, Glenaladale	9·33
,,	Lynmouth, Glenthorne.	5·17	XIX.	Lairg H.R.S.	...
,,	St. Austell, Cosgarne...	...	,,	Forsinard H.R.S.	5·26
,,	Taunton, Fullands	2·51	,,	Watten H.R.S.	2·98
VI.	Bristol, Clifton	...	XX.	Fermoy, Glenville	6·76
,,	Ross	4·63	,,	Tralee, Castlemorris ...	6·59
,,	Wem, Sansaw Hall.....	3·95	,,	Cahir, Tubrid	6·18
,,	Cheadle, The Heath Ho.	3·86	,,	Newcastle West	3·98
,,	Worcester, Diglis Lock	4·21	,,	Kilrush	4·20
,,	Coventry, Coundon	3·93	,,	Corofin	6·00
VII.	Melton, Coston	2·86	XXI.	Kilkenny, Butler House	...
,,	Ketton Hall [Stamford]	3·25	,,	Carlow, Browne's Hill..	5·83
,,	Horncastle, Bucknall ...	2·32	,,	Navan, Balrath	6·37
VIII.	Macclesfield, The Park.	5·27	,,	Athlone, Twyford	7·41
,,	Walton-on-the-Hill.....	4·80	XXII.	Mullingar, Belvedere ...	5·31
,,	Broughton-in-Furness ..	8·65	,,	Ballinasloe	6·38
IX.	Wakefield, Stanley Vic.	2·89	,,	Clifden, Kylemore	9·27
,,	Ripon, Mickley	3·92	,,	Crossmolina, Enniscoe..	6·58
,,	Scarborough.....	2·74	XXIII.	Carrick-on-Shannon ...	5·18
,,	East Layton [Darlington]	3·98	,,	Dowra	4·46
,,	Middleton, Mickleton ..	3·93	,,	Rockcorry.....	5·71
X.	Haltwhistle, Unthank..	4·60	,,	Warrenpoint	6·33
,,	Carlisle, St. James Rd...	4·84	,,	Newtownards	4·17
,,	Shap, Copy Hill	8·69	,,	Belfast, New Barnsley .	5·99
XI.	Llanfrechfa Grange	5·15	,,	Bushmills	6·68
,,	Llandovery	8·24	,,	Buncrana	5·64
,,	Solva	4·01			

JULY, 1882.

Div		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of Nights below 32° In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·95	+ ·48	·95	10	18	77·8	30	46·0	1	0	0
II.		Maidstone (Hunton Court)...	2·94	+ ·90	·72	15	19	...	...	...	...	...	...
,,		Strathfield Turgiss	1·60	— ·70	·24	24	16	77·2	30	42·7	27	0	0
III.		Hitchin	2·65	— ·05	·75	11	21	73·0	3	46·0	9*a*	0	0
,,		Banbury	4·29	+ 1·31	·85	8	24	75·0	2, 3	45·0	8	0	...
IV.		Bury St. Edmunds (Culford)	1·88	— 1·09	·44	11	22	75·0	29	39·0	26	0	...
,,		Norwich (Cossey)	2·74	— ·01	·79	11	18	77·0	29	41·5	27	0	...
V.		Bridport	3·64	...	·57	14	14	..	..	...	...	...	...
,,		Barnstaple.....	5·03	+ 1·48	·75	6	21	77·0	29	47·0	31	0	...
,,		Bodmin	6·31	+ 2·87	1·35	10	22	71·0	14	47·0	27	0	0
VI.		Cirencester	5·89	+ 2·88	2·20	11	20	...	...	...	...	...	...
,,		ChurchStretton(Woolstaston)	4·09	+ 1·06	·70	11	25	74·0	1	47·0	10*a*	0	0
,,		Tenbury (Orleton)	3·50	+ ·59	1·32	11	23	77·0	2	41·6	10	0	0
VII.		Leicester	3·36	..	·97	11	25	74·3	2	46·8	10	0	0
,,		Boston	2·42	— ·11	·59	9	17	78·0	29	47·0	27*c*	0	...
,,		Grimsby.....	2·73	— ·05	·76	8	22	72·0	3, 4	46·0	27	0	...
,,		Mansfield	...	...	...	...	...	...	...	...	...	...	...
VIII.		Manchester (Ardwick).....	5·56	+ 1·75	1·57	17	25	75·0	2, 3	50·0	25	0	...
IX.		Wetherby (Ribstone Hall) ...	2·75	+ ·14	·64	28	12	...	...	...	...	...	...
,,		Skipton (Arncliffe)	9·64	+ 4·69	1·11	6	27	76·0	1	39·0	26	0	...
X.		North Shields	3·80	+ 1·25	·73	10	21	75·0	2	43·0	27	0	0
,,		Borrowdale (Seathwaite).....	21·04	+12·27	3·29	13	29	...	...	...	...	..	...
XI.	WALES.	Cardiff (Ely).....	5·18	+ 1·37	·75	6	25	...	...	...	...	...	...
,,		Haverfordwest	7·02	+ 3·09	1·23	13	21	71·0	1	41·5	26	0	...
,,		Plinlimmon (Cwmsymlog) ...	7·85	...	·91	31	26	...	...	...	..	...	...
,,		Llandudno.....	2·55	— ·16	·48	6	18	70·0	2, 3	49·2	27	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	6·37	+ 3·24	1·68	14	28	70·4	1, 12	46·2	27	0	...
,,		Hawick	4·06	+ ·94	·65	25	23	...	...	..	...	...	.
XIV.		Douglas Castle (Newmains)	5·17	+ 1·88	·86	14	27	...	...	...	...	...	...
XV.		Lochgilphead (Kilmory).....	8·33	+[xx]3·79	1·77	23	24	...	...	42·0	8*d*	0	...
,,		Appin (Airds)	7·09	...	...	...	...	...	...	...	...	...	...
,,		Mull (Quinish).....	5·26	...	1·08	3	24	...	...	...	...	...	...
XVI.		Loch Leven Sluices	4·00	+ ·95	·90	15	21	...	...	...	...	...	...
,,		Arbroath	3·54	+ ·90	·47	14	21	70·0	2, 29	45·0	26	0	...
XVII.		Braemar	4·39	+ 1·53	·87	1	26	72·8	28	41·0	23	0	0
,,		Aberdeen	3·32	...	·62	2	18	71·0	14	45·0	25	0	0
XVIII		Skye (Sligachan)	9·42	...	1·30	19	24	...	...	...	...	..	...
,,		Culloden	1·97	— ·81	·32	6	16	71·0	2	45·5	21	0	0
XIX.		Dunrobin	4·25	...	·70	8	21	71·0	29	45·0	21*e*	0	...
,,		Orkney (Sandwick)	2·44	— ·22	·63	3	20	65·4	22	47·4	5	0	0
XX.	IRELAND.	Cork (Blackrock)	5·24	+ 2·40	·76	7	23	85·0	1	43·0	25	0	...
,,		Dromore Castle	8·86	...	·72	26	24	69·0	2	43·0	25	0	...
,,		Waterford (Brook Lodge) ...	5·41	...	·88	12	19	76·0	1	44·0	26	0	...
,,		Killaloe	6·24	...	·74	13	26	78·0	10	41·0	26	0	...
XXI.		Portarlington	5·84	+ 3·16	·64	9	28	77·0	2	45·0	8	0	...
,,		Dublin (Monkstown)	...	...	...	...	...	...	...	...	...	...	...
XXII.		Galway (Queen's College) ...	...	...	...	...	...	...	...	...	...	...	...
XXIII.		Waringstown	4·40	+ ·82	·43	20	24	77·0	2, 11	45·0	25	0	0
,,		Londonderry...	...	...	...	...	...	...	...	...	...	...	...
,,		Omagh (Edenfel)	7·04	+ 3·79	·80	6	30	67·0	26	42·0	25	0	0

+ Shows that the fall was above the average ; — that it was below it.

a And 25. *c* And 31. *d* And 11, 26. *e* And 26. *f* And 27.

METEOROLOGICAL NOTES ON JULY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—An unsettled month; harvest commenced on the 19th.

BANBURY.—The showery weather during the month interfered greatly with the gathering of the hay, many fields being uncut at the end of the month. Mean temp. 60°·6. TS with H on 8th; T and L on 2nd; L on 20th.

CULFORD.—The month was very unsettled, and although the total rainfall is small, the number of wet days is unusually great; a good deal of T and L with occasional H, which in some parts of the county was very heavy.

COSSEY.—A cool month, with sunshine and showers, favourable for growing crops; the temp. rose above 70° only on twelve days, and fell below 50° on 5 nights; TS on 7th, two cottages at Ringland struck by L and burnt; heavy shower on 17th, ·39 in. of R fell in half an hour.

BODMIN.—A wet, cold, and very ungenial month, often more like October than July; mean temp. 61°·0.

CIRENCESTER.—A month of excessive R. with low temp.; one of the worst hay-making seasons ever known.

WOOLSTASTON.—A cold, wet, and dreary month; six days only without R; much of the hay crop quite ruined.

ORLETON.—The first three days were fine and warm with a few spots of R each day. The remainder of the month was very showery with a low temp. and rough wind almost every day. Distant T was heard on 1st, 2nd, 3rd, 13th, 24th, and 27th, and a smart storm of L and T occurred on the 10th, followed by a very heavy rainfall on the 11th. The grass was a heavy crop, but much of it was damaged by the daily R. Mean temp. of the month more than 2° below the average of 20 years.

LEICESTER.—The month was very unsettled, R falling on 25 days; the hay crop, which is very abundant, has been for the most part secured, though not in good condition. TSS on 2nd and 24th.

BOSTON.—An unfavourable month for farm crops; although the rainfall was not above the average, the frequency of the showers rendered hay-making a tedious process. The mean temp. was 1°·5 below the average, which, with the many dull gloomy days and frequent low temp. at night, was detrimental to the wheat and other corn crops.

KILLINGHOLME.—Crop of grass enormous, of corn moderate, of roots very good; the corn harvest is likely to be late. T and L on 8th, 10th, 12th, 19th, and 25th; T on 7th, 9th and 24th.

MANCHESTER.—A very unseasonable month; very little sunshine and almost constant R; the temp., too, was comparatively low. A few TSS occurred, one on the 16th being very heavy.

ARNCLIFFE.—An unusually heavy rainfall, disastrous to the hay harvest, and frequent TSS.

NORTH SHIELDS.—TSS on 10th and 12th, and T on three other days.

WALES.

LLANDUDNO.—In 13 years out of 21, July here is the warmest summer month, but this year it is to be hoped will prove an exception, for the mean temp. (57°·9) of the month which has just expired was nearly 4° below the average. Altogether July was not a genial month, but owing to the considerable amount of bright sunshine (164·2 hours), most of the hay was fairly well secured, and the grain crops are more promising than was anticipated.

HAVERFORDWEST.—The temp. was low throughout the month, the max. reaching 70° on four days only, but the nights were warm. It was the wettest July since 1861, when 8·13 in. of R fell on 13 days.

SCOTLAND.

CARGEN.—The wettest July since observations were commenced here (23 years) ; it rained more or less every day, although on three days the fall did not amount to ·01 in., but notwithstanding the heavy rainfall, the duration of sunshine (244 hours) was about the average. The weather was bad for securing the hay, but all other crops are luxuriant. Mean temp. of the month 59°·2 half a degree below the average. S. winds prevailed on 26 days.

HAWICK.—The month was chiefly remarkable for TSS, but the heavy rains produced a grand crop of hay.

BRAEMAR.—A wet, dark, but mild month. T and L on 7 days.

ABERDEEN.—Very thundery wet weather, rainfall considerably above the average ; on only one day did the max. temp. exceed 69°.

SLIGACHAN.—Only six days on which no R fell, but crops and stock look well. Nothing but sunshine and dry weather is wanted to secure the heaviest crop of hay for 20 years.

CULLODEN.—Temperature of the month below the average ; TSS very general ; frequent R, but no heavy falls.

SANDWICK.—The weather in July was pleasantly warm, with sufficient R for the crops which are very promising ; T on 19th and 24th ; a sleet shower on 29th.

IRELAND.

DROMORE CASTLE.—The wettest July on record ; hay, a heavy crop, but saved with difficulty and deficient in quality, many meadows being left uncut till overripe in consequence of the continuous R. Potatoes injured by storms and blight, but not extensively so beyond the sea-coast ; corn crops very good and promising.

WATERFORD.—The wettest July of the last eight ; rainfall nearly double the average ; weather wild and uncertain during the whole month.

KILLALOE.—A deplorable month, the rainfall has only once been exceeded in amount in the same month during 36 years (viz. in July, 1861, 6·51 in.) Hay crop spoiled to a great extent.

WARINGSTOWN.—Wet but not cold ; some damage to wheat and potatoes and early hay, but crops generally good.

EDENFEL.—With the exception of December, 1876, the past month was the wettest in 20 years, hopelessly damaging to potatoes and some hay.

GREAT HAILSTORM NEAR BRISTOL.

A Bristol correspondent sends us the following note relative to a great hailstorm near Bristol :—"On the evening of the 25th ult., this neighbourhood was visited by one of the most extraordinary hail-storms ever witnessed, the ground being covered with hail, which remained in many places the whole of the night, for on Wednesday morning we measured some where it had rolled into a heap 5½ inches deep at seven o'clock. We have not a flower left outside, and I fear tender plants such as Alternantheras and Coleus are permanently injured, as they were covered up for some time in hailstones, and now they have the appearance of having been frozen. Everything is more or less damaged, Beet especially so."—*Journal of Horticulture.*